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(71) Applicant
Alfred Teves GmbH

(Incorporated in the Federal Republic of Germany)

7 Guerickestrasse, 6000 Frankfurt am Main,
Federal Republic of Germany

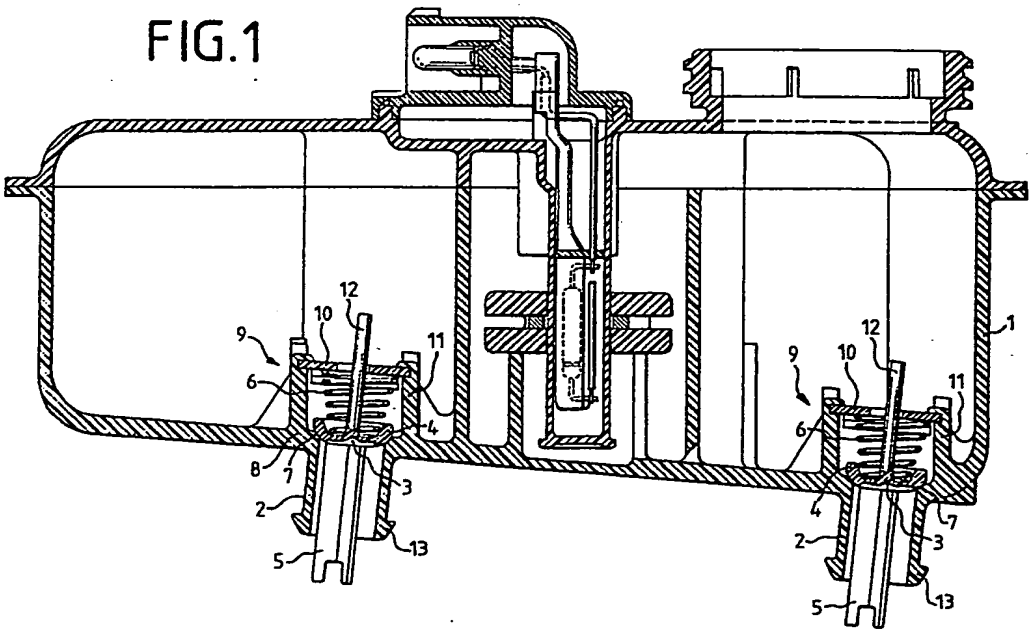
(72) Inventors
Peter Boehm
Peter Tandler
Gabriele May
Tobias Walther

(74) Agent and/or Address for Service
Ruffhead & Vaufrouard
Maidstone Road (STC Site), Foots Cray, Sidcup,
Kent, DA14 5HT, United Kingdom

(54) Master brake cylinder and a supply tank assembly

(57) An assembly comprising a master brake cylinder and a supply tank (1) includes a non-return valve (3) incorporated in the connecting nozzle (2) of the supply tank (1). When the supply tank (1) is fastened to the master brake cylinder an element (5) is engaged to open the valve (3) which seals off the supply tank (1) if and when it is detached from the master cylinder. The valve (3) may be inclined to the axis of the nozzle (2) and may comprise a ball-shaped valve member or a ball and socket joint.

FIG.1



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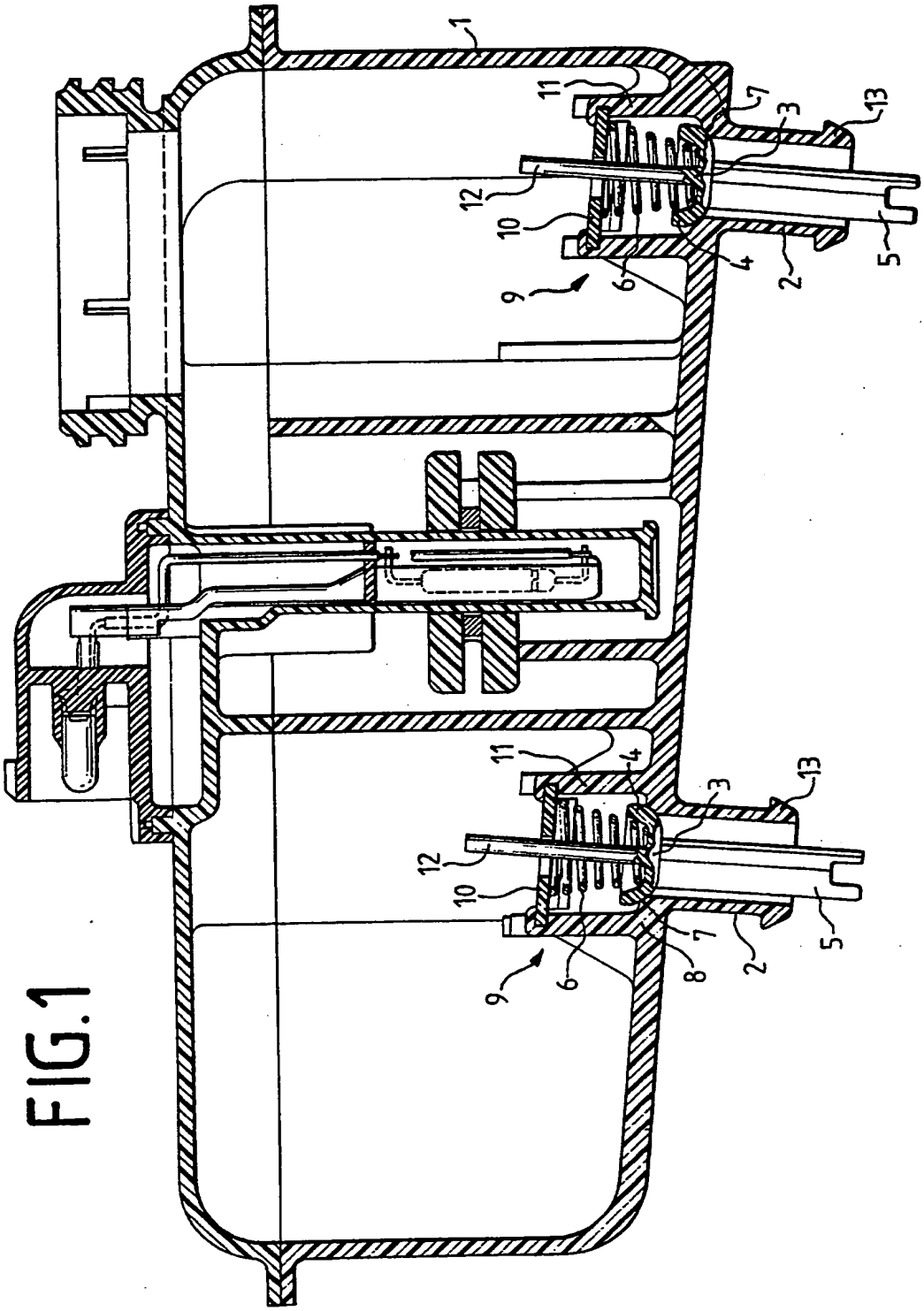


FIG.1

P. Böhm - 34
P. Tandler - 30
G. May - 1
T. Wandler - 1

FIG.2

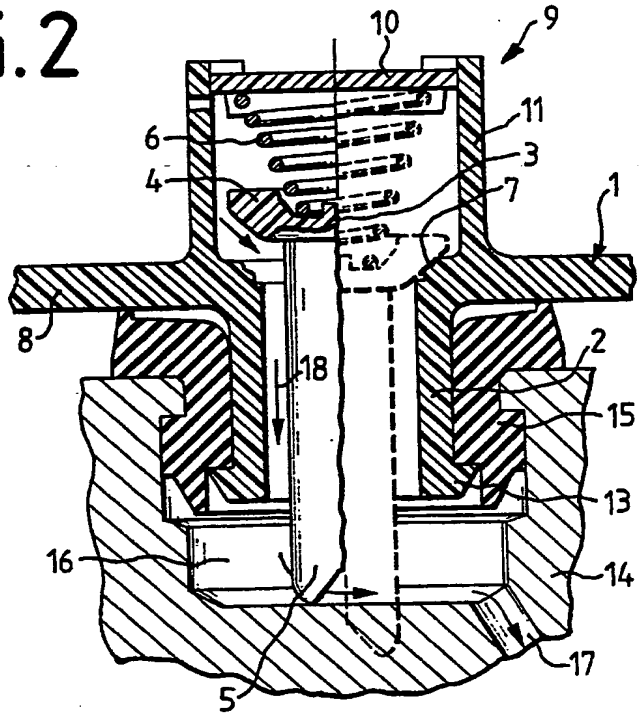
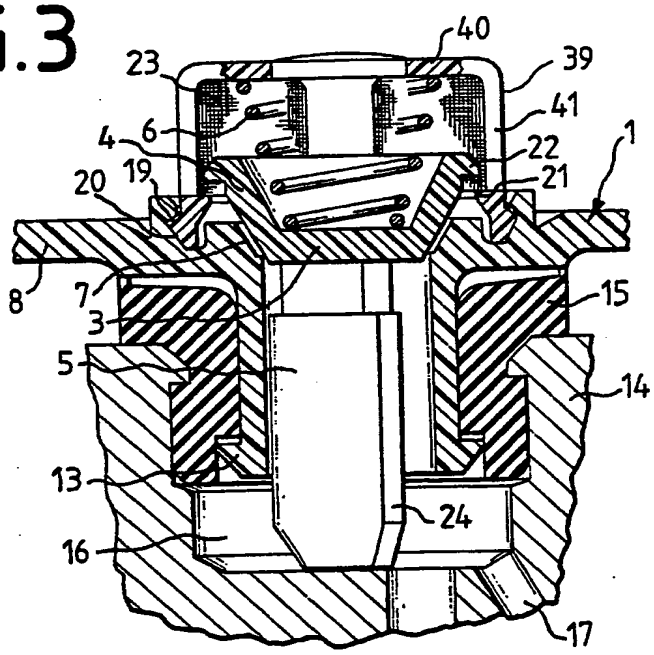


FIG.3



P. Böhm -34
P. Tandler -30
G. May - 1
T. Walther - 1

FIG.4

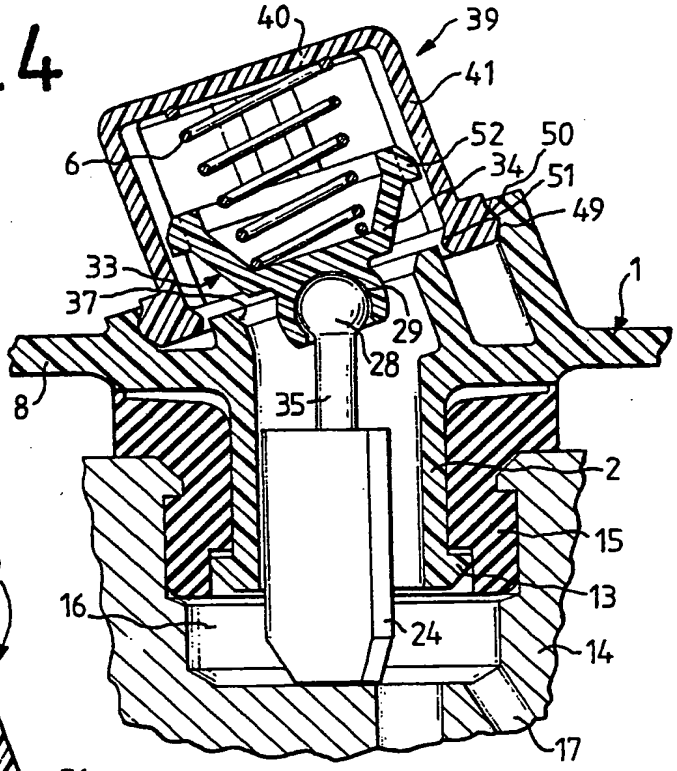
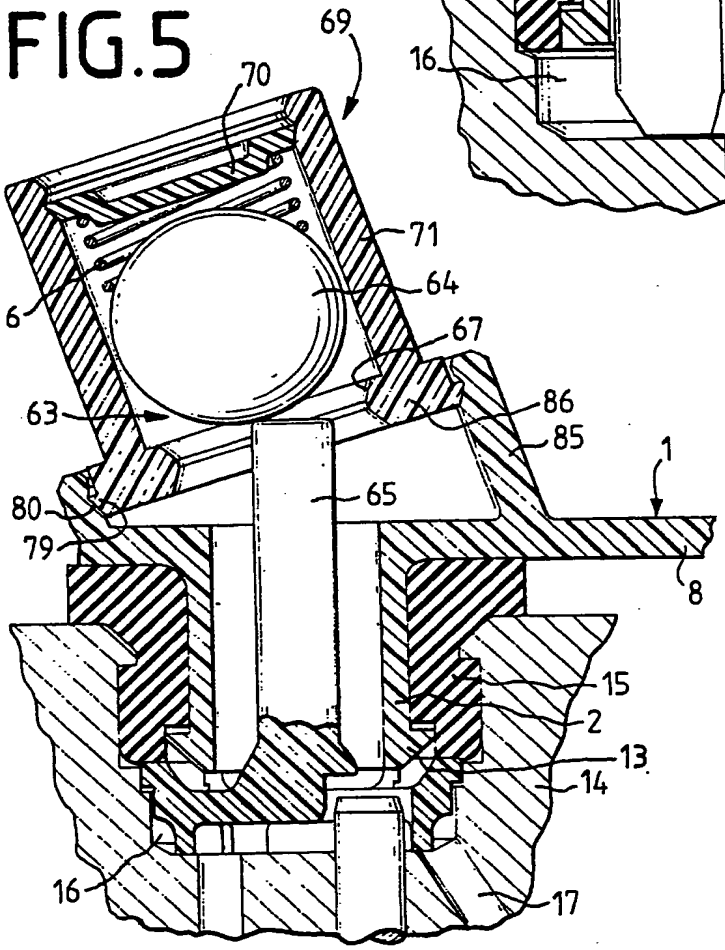


FIG.5



P. Böhm -34
P. Tandler -30
G. May - 1
T. Walther - 1

A MASTER BRAKE CYLINDER AND SUPPLY TANK ASSEMBLY

This invention relates to an assembly of master brake cylinder and supply tank including a hydraulic fluid connection between the tank and cylinder.

A master brake cylinder and supply tank assembly is known from the Brake Handbook (Bartsch Verlag, Ottobrunn, 8th edition, 1984, page 38 of the edition in German). Such assemblies or assemblies similar thereto are used in all hydraulic braking systems for vehicles. The inconvenience of spillage or loss of hydraulic fluid from the supply tank of the assembly as soon as the supply tank becomes detached or separated from the master brake cylinder of the assembly, no matter whether the separation occurs intentionally in a garage or workshop, or unintentionally, as for example, in the case of an accident, is a disadvantage common to all of the aforesaid assemblies. Moreover, in the event of an accident, inflammable hydraulic brake fluid may come into contact with hot engine parts and thereby cause a vehicle fire.

It is an object of the present invention to increase the safety of operation of an assembly of the kind mentioned above without any substantial modification of its set-up.

According to the present invention there is provided a master brake cylinder and a supply tank assembly including a hydraulic fluid connection between the tank and cylinder, characterised in that in a tank connecting nozzle

incorporates a non-return valve which shuts off and opens, respectively, the hydraulic fluid connection between the master brake cylinder and the supply tank and the actuating element of the valve extending all way through the tank connecting nozzle so that the non-return valve is kept open by a connecting member connecting the valve to the said master brake cylinder when the tank is attached thereto.

Thus a non-return valve which is opened by mounting the supply tank on the master brake cylinder is provided in the connecting nozzle of the tank. The supply tank will be closed again by the non-return valve only at the moment at which the supply tank becomes detached from the master brake cylinder.

Advantageously, the actuating element may be constituted by three ribs which are offset 120 degrees. On the one hand, this design affords virtually unobstructed flow of hydraulic fluid through the connecting nozzle of the tank and, on the other hand, the actuating element is sufficiently sturdy so as to guarantee a reliable opening of the non-return valve.

It will be advantageous for the closing member and actuating element to be directly connected to each other and it will be particularly appropriate when both of them are manufactured as one part. The direct connection affords easy mechanical opening of the non-return valve in so far as the actuating element is urged into the supply tank by the master brake cylinder and transmits movement directly to the closing member, so lifting the latter from its sealing seat. The lifting motion takes place in opposition to a spring force which ensures that the non-return valve closes to prevent leakage of fluid from the tank through the connecting nozzle as soon as the supply tank and the master brake cylinder become detached from each other.

It is envisaged that the spring is supported by a support plate which is retained for this purpose by two or more struts within the supply tank.

One method of anchoring the support means in the supply tank is to weld the struts to the bottom of the supply tank. As an alternative, it will, obviously, be possible to furnish the struts with a torus by which they are allowed to locate themselves in matching countershaped forms at the bottom of the supply tank.

This latter arrangement can be optimised further in that projections may be applied to the struts against which retaining noses of the closing member can abut, as a result of which the closing member together with the actuating element and the spring as well as the support means for supporting the spring together with the supporting plate and the struts will allow to be incorporated in the supply tank in pre-assembled condition and in the form of one unit only.

The above-mentioned pre-assembly will be facilitated when an extension is coupled to the closing member which projects through the supporting plate into the supply tank and which prevents the spring from falling out during the assembly operation.

In an advantageous embodiment, the sealing seat is inclined at an angle between 10 degrees and 45 degrees with respect to the bottom of the tank. Due to this inclination, an easy removal from the mould is safeguarded, even if and when the sealing seat is moulded to the tank bottom if this is demanded in view of the shape of the supply tank.

When the sealing seat is inclined with respect to the bottom of the supply tank it will be advantageous either to construct the closing member in the shape of a ball or else to connect the closing member and the actuating element to each other by means of a spherical joint. In both cases, a transmission of power for the purpose of opening of the non-return valve will be possible in an easy and reliable manner.

By injecting filter gauze into the space between the bottom of the supply tank, the struts, and the supporting plate, it can be ensured in a simple manner that

no coarse mud which might have accumulated in the course of time in the supply tank makes its way into the master brake cylinder so as to obstruct any seals or even any brake lines which extend to the wheel cylinders.

By way of example various embodiments of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows a cross-section through a supply tank for a master cylinder and supply tank assembly the tank having a non-return valve;

Figure 2 shows a cross-section through the supply tank of Figure 1 mounted to the master brake cylinder of the assembly with one connecting nozzle only being illustrated in detail;

Figure 3 shows a different version of the non-return valve shown in Figure 1 with filter gauze in a cross-sectional view;

Figure 4 shows a cross-section through a further form of non-return valve of the supply tank with a sealing seat for the valve being inclined with respect of the bottom of the supply tank and with a spherical joint connection between the closing member and the actuating element; and

Figure 5 shows a cross-section through a still further construction of non-return valve, the closing member being formed by a ball and the sealing seat being inclined with respect to the bottom of the supply tank.

Referring to Figure 1 this shows a cross-section through a supply tank 1 of known general design with connecting nozzles 2. In each of the connecting nozzles 2 there is a non-return valve 3 which comprises a closing member 4, an actuating element 5, a spring 6, and a sealing seat 7 which is integrated in the bottom 8 of the supply tank 1. The spring 6 is supported by support means 9 which consists of a supporting plate 10 which is retained by struts 11 of the support means joined to the tank. As shown in Figure 1, the struts 11 are moulded or welded to the bottom 8. The closing member 4 has an extension 12 which

projects through the supporting plate 10 into the supply tank 1. The connecting nozzles 2 have attachment noses or projections 13 by means of which the supply tank 1 is fastened to a master brake cylinder not illustrated in Figure 1 but indicated fragmentarily at 14 in the other Figures to be described later. The valve actuating element 5 projects all the way through the connecting nozzle 2. Figure 1 shows the supply tank detached from the master brake cylinder 14. For this reason, the non-return valves are shown in their tank-sealing position.

Figure 2 shows one of the connecting nozzles 2 of the supply tank 1 and the associated non-return valve 3 mounted on the master brake cylinder 14, the closed position of the non-return valve 3 being outlined by a dashed line. As shown in Figure 1, the struts 11 are moulded to the tank bottom 8 and retain the supporting plate 10. The attachment noses 13 make catch engagement behind a seal 15 which is inserted in the master brake cylinder 14. The actuating element 5 projects into a recess 16 of the master brake cylinder 14 from which recess 16 a duct 17 establishes a connection to the master cylinder pressure chambers which are not shown in the drawing. The depth of the recess 16 is selected such that the actuating element 5 lifts the closing member 4 from the sealing seat 7 by some millimetres as soon as the supply tank 1 has been mounted on the master brake cylinder 14. This takes place by the actuating element 5 bearing against the bottom of the recess 16 and thereby being moved mechanically in the direction of the interior space of the supply tank 1. A flow of hydraulic fluid as indicated by the arrows 18, that is to say, from the supply tank 1 through the connecting nozzle 2 and the duct 17 into the master brake cylinder 14, is possible when the non-return valve 3 is in the open condition as illustrated.

Figure 3 shows another valve-fixing arrangement. Toruses 19 are provided on the struts 41 which engage countershaped parts 20 provided on or in the bottom 8 of the

supply tank 1. In addition, the struts 41 are formed with projections 21 behind which retaining noses 22 of the closing member 4 make catch engagement. This construction offers the possibility of pre-assembling the non-return valve 3 together with the closing member 4 and the actuating element 5 fastened to it by moulding, the spring 6, the supporting plate 40, and the struts 41 and then to insert it as one unit into the tank bottom 8 where the sealing seat 7 is provided. The space between the supporting place 40, the struts 41, and the closing member 4 is filled up with filter gauze 23, the apparatus 39 being designed as a single part. It will also be seen that the actuating element 5 comprises three ribs 24 offset by 120 degrees and which facilitates the flow of hydraulic fluid.

Figure 4 shows a further valve structure featuring a sealing seat 37 which is inclined with respect to the bottom 8 of the tank. Identical elements are given the same reference numerals as those used in Figures 1 to 3, whereas similar elements are given reference numerals which are each increased by 30. Exactly as shown in Figure 3, the struts 41 are formed integrally with the supporting plate 40. The sealing seat 37 is moulded to the tank bottom 8, so as to provide an angle as shown. The actuating element 35 at the end thereof adjacent the closing member 34 comprises a ball end 28 which forms a spherical joint with a spherical recess 29 in the closing member 34. By this arrangement the closing member 34 is lifted off the sealing seat 37 as soon as the lower end of the actuating element 35 comes to butt against the bottom of the recess 16.

Figure 5 shows yet a further valve structure. Identical elements are given the same reference numerals as those in Figures 1 to 4, whereas similar elements are given reference numerals increased by 60 relative to Figures 1 to 3. The actuating element 65 is retained within the recess 16 by the seal 15 which seals off the connecting nozzle 2 in respect of the master brake cylinder 14. Retaining extensions 85 are moulded to the tank bottom 8 and a plate

86 is retained by the extensions so that the plate is held at an angle of inclination with respect to the bottom 8. The plate 86 also constitutes the sealing seat 67 which interacts with the closing member 64 which is in the shape of a ball. Struts 71 are moulded to the plate 86 and the supporting plate 70 is retained by the struts so the spring 6 is supported by the plate 70. The non-return valve 63 is shown in the open position, the actuating element 65 lifting off the ball-shaped closing member 64 from the sealing seat 67 against the spring force.

CLAIMS:

1. A master brake cylinder and a supply tank assembly including a hydraulic fluid connection between the tank and cylinder, characterised in that in a tank connecting nozzle (2) incorporates a non-return valve (3) which shuts off and opens, respectively, the hydraulic fluid connection between the master brake cylinder (14) and the supply tank (1) and the actuating element (5,35,65) of the valve extending all the way through the tank connecting nozzle (2) so that the non-return valve (3) is kept open by a connecting member connecting the valve to the said master brake cylinder (14) when the tank is attached thereto.

2. An assembly as claimed in claim 1, characterised in that the actuating element (5,35) is constituted by three ribs (24) which are offset by 120 degrees with respect to one another and slides in the tank connecting nozzle (2) without any risk of jamming.

3. An assembly as claimed in claim 1 or in claim 2, characterised in that the diameter of the actuating element (5,35) is reduced in the range of guidance within the tank connecting nozzle (2).

4. An assembly as claimed in any preceding claim, characterised in that the non-return valve comprises a sealing seat, a closing member (4) loaded by a spring (6), and the actuating element and in that the sealing seat (7) is formed in the bottom (8) of the said supply tank (1).

5. An assembly as claimed in claim 4, characterised in that the actuating element (5) is moulded to the closing member (4).

6. An assembly as claimed in claim 4 or in claim 5, characterised in that the spring (6) is supported by support means (9) which projects into the supply tank (1).

7. An assembly as claimed in claim 1, characterised in that the non-return valve is constituted by a sealing seat, a closing member loaded by a spring, and by the said actuating element, and in that the sealing seat (37,67) is inclined at an angle between 10 degrees and 45 degrees to

the bottom (8) of the said supply tank (1).

8. An assembly as claimed in claim 7, characterised in that the sealing seat (37) is moulded to the said bottom (8).

9. An assembly as claimed in claim 7, characterised in that the actuating element (35) at the end thereof adjacent the closing member (34) incorporates a ball end (28), the closing member (34) being formed with a spherical recess (29) for the accommodation of the ball end (28).

10. An assembly as claimed in claim 7, characterised in that the spring (6) is supported by support means (69) projecting into the supply tank whose axis of symmetry is normal with the plane which is formed by the sealing seat (37).

11. An assembly as claimed in claim 6 or in claim 10, characterised in that the support means (9,69) comprises a supporting plate (10,40,70) and at least two struts (11,41,71).

12. An assembly as claimed in claim 11, characterised in that the struts (11,41) are fastened, preferably welded, to the tank bottom (8).

13. An assembly as claimed in claim 11, characterised in that the struts (11,41) present a torus (19,49) which is engageable with matching countershaped parts (20,50) at the bottom (8).

14. An assembly as claimed in any one of claims 11 to 13, characterised in that projections (21,51) are provided on the struts (11,41), by which projections (21,51) the closing member (4,34) is supportable on retaining noses (22,52) thereof.

15. An assembly as claimed in claim 14, characterised in that the closing member (4,34) the actuating element (5,35), the supporting plate (10,40) the struts (11,41) and the said spring (6) allow the valve to be pre-assembled and be inserted as one unit into the supply tank (1).

16. An assembly as claimed in claim 11,

characterised in that the closing member (4) has an extension (12) which extends into the supply tank (1) and which projects all the way through the supporting plate (10).

17. An assembly as claimed in claim 11, characterised in that the support means (9,39) is designed as a unit part.

18. An assembly as claimed in claim 7, characterised in that the actuating element (65) is attached to the master brake cylinder (14) by a seal (15) which seals off the connecting nozzle (2) of the supply tank (1) with respect to the master brake cylinder (14).

19. An assembly as claimed in claim 7, characterised in that the sealing seat (67) is formed by a plate (86) which is held by retaining extensions (85) which are coupled to the bottom (8).

20. An assembly as claimed in claims 11 and 19, characterised in that the support means (69) is coupled to the plate (86).

21. An assembly as claimed in claim 20, characterised in that the struts (71) are moulded to the plate (86).

22. An assembly as claimed in any one of claims 11 to 16, 20 or 21, characterised in that the supporting plate (70) is held by the struts (71).

23. An assembly as claimed in claim 7, characterised in that the closing member (64) is of spherical shape.

24. An assembly as claimed in any one of claims 4 to 23, characterised in that the spring (6) comprises a conical spiral compression spring.

25. An assembly as claimed in any one of claims 4 to 23, characterised in that the spring (6) comprises a cylindrical spiral compression spring.

26. An assembly as claimed in any one of the preceding claims, characterised in that a filter gauze (23) is injected in the space between the struts (11,41,71), the

supporting plate (10,40,70), and the said sealing seat (7,37,67).

27. A master cylinder and supply tank assembly substantially as hereinbefore described with reference to Figures 1 and 2, or 3 or 4 or 5 of the accompanying drawings.

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